MI RF Power Calculation

- Cavity Q = 3000 (at max ramp rate), R/Q = 104 Ω, R = 3.1 x 10^5 Ω
- **17 cavities**, each delivering **175 kW** (max 200 kW) for a **total of 3.0 MW**
- **Wall/tuner loss**: V(gap) = 240 kV ⇒ P = **92 kW each**, **total of 1.57 MW** for 17 cavities
- Beam intensity: 3.3 x 10^{13}, 4.0 x 10^{13} and 6.0 x 10^{13}

Ramp rate (GeV/s)	Beam intensity	Power to the beam (MW)	Wall/tuner loss (MW)	**Total power (MW)**
240	3.3 x 10^{13}	1.27	1.57	**2.84 (o.k.)**
240	4.0 x 10^{13}	1.54	1.57	**3.11**
240	6.0 x 10^{13}	2.30	1.57	**3.87**
280	3.3 x 10^{13}	1.48	1.57	**3.05**
280	4.0 x 10^{13}	1.79	1.57	**3.36**
280	6.0 x 10^{13}	2.69	1.57	**4.26**

Need second PA for either higher beam intensity or fast ramp!

2nd Type (High Intensity) Robinson Instability

- Power dissipation:
  - Anode power = 100 kW (absolute max 150 kW)
  - Wall/tuner loss = 92 kW
  - Energy dissipation per cavity= 192 kW
  - Total dissipation of 17 cavities = **3.3 MW**
- Power delivered to the beam: (see previous table)
- Stability criterion:
  - Dissipation power > Power to the beam
  - Beam stable in all three cases: 3.3×10^{13}, 4.0×10^{13} and 6.0×10^{13}